THE WESTERN AUSTRALIAN
NATURALIST

Vol. 1 DECEMBER 15, 1947 No. 3

THE FLUVIFAUNULÆ OF AUSTRALIA
with particular reference to
FRESHWATER FISHES IN WESTERN AUSTRALIA

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Whilst the seas around Australia are inhabited by over two thousand distinct species of fishes, the freshwater rivers are the preserves of a hardy few, probably only about 150 kinds in all the continent, if we exclude introduced forms, such as trout, and occasional stragglers into freshwater, like gobies, soles, stingrays, toadoes, anchovies, and other estuarine fishes. By comparison with other continents, Australia has not a large freshwater fauna, due to the absence of many large rivers and the prevalence of droughts. We find no trace of certain families of fishes commonly found in the rivers of countries the other side of Wallace's Line. There are no *native* members of the carp tribe (Cyprinidae), no killifishes (Cyprinodontidae) and very few catfishes. What we lack in variety, however, we make up for in interest as only the fittest of our freshwater fishes have survived and some of these have persisted for millions of years, long after their relatives had died out in other parts of the world. Such "fossil fishes" as the Queensland Lungfish *(Neoceratodus)* and Burramundi *(Scleropages)* and probably, the freshwater Blackfish or Slippery are examples. Others like the Murray Cod, certain gudgeons, freshwater herring, perches and grunters have evidently been derived long ago from marine ancestors but are now purely fluviatile. Lampreys and freshwater eels still spend part of their lives in the sea as do one or two species of Native Minnow (Galaxiidae). Obviously, much of the Australian freshwater fauna is very ancient and has become established as a result of long ages of natural selection, developed, it may be from several "invasions" from the sea by different types of fishes at different periods. Many of our rivers are now populated with the introduced Trout, English Perch and Carp. Mosquito-destroying fish have also been introduced although many of our small native fish are adequate for this purpose. The rapidity with which a hardy new species might spread under favourable conditions is exemplified by *Gambusia,* an introduced pest in the guise of a mosquito-controller, which has increased prodigiously at the expense of the Australian fauna in areas to which it has been introduced.

Our purely fluviatile native fishes inhabit fairly definite limits,

determined, in the first place, by the extent of river-systems, and by climate and land-barriers. However, the zoogeographical regions inhabited by our freshwater fishes do not fit so exactly into the various river-systems to enable usage of their names, so an alternative scheme whereby the animals of our lakes and rivers are classed into fluvifaunulae has been proposed (Iredale and Whitley, *South Australian Naturalist,* vol. xviii, 1938, pp. 64-68 and map). A fluvifaunula—derived from the Latin *fluvius,* a river, plus the diminutive of fauna—is a consociation of animals found in a river or a series of rivers. Each was named in honour of a naturalist or explorer associated with the fluvifaunula concerned.

Iredale and Whitley proposed:

1. **The Leichhardtian Fluvifaunula.**
   (Named after Ludwig Leichhardt) for the Rivers of Northern Territory and from about Broome eastwards to Queensland, west of Torres Straits, and extending to the southern half of New Guinea.
2. **The Greyian Fluvifaunula.**
   (Named after George Grey) for Rivers of the Dampierian sub-area, about Ninety Mile Beach to south of Shark's Bay, Western Australia.
3. **The Vlaminghian Fluvifaunula.**
   (After Willem Vlamingh) for fresh waters of S.W. Australia.
4. **The Sturtian Fluvifaunula.**
   (After Charles Sturt) for Central Australia, westward of the Darling System.
5. **The Mitchellian Fluvifaunula.**
   (After Thomas Mitchell) for the Murray River system.
6. **The Lessonian Fluvifaunula.**
   (After Rene Primevere Lesson, French naturalist) for Rivers of eastern N.S.W., Victoria and northern Tasmania.
7. **The Tobinian Fluvifaunula.**
   (After George Tobin, a naturalist with Bligh) for southern Tasmanian rivers.
8. **The Krefftian Fluvifaunula.**
   (After Gerard Krefft, discoverer of the Queensland Lungfish) for the Mary-Burnett Rivers, Queensland.
9. **The Jardinean Fluvifaunula.**
   (After the Jardine family) for Eastern and N. Queensland.
10. **The Gaimardian Fluvifaunula.**
    (After Joseph Paul Gaimard, French naturalist) for rivers of northern New Guinea.

Subsequent study of more material, not only of fishes but of molluscs, and consultation with colleagues regarding other groups (crustacea, river-tortoises, etc.), has confirmed, with slight modifications, the fluvifaunular limits proposed in 1938. Naturally our divisions of Australia into areas were not intended as hard-and-fast outlines, and, since the ana-branches and upper reaches of our rivers interlock like clasped fingers in some regions, or

river-captures may result from intruded barriers, it is impossible to do more than broadly outline these zoogeographical limits on a small map, but the latest limits are as shown on the accompanying map (Fig. 1).

For the present paper, we need not consider further the fluvifaunulae of States outside Western Australia. Here, we have the Vlaminghian fluvifaunula in the South-west, the Sturtian centre, the Greyian north-west fluvifaunula, and, in the far north, the outlying parts of the great Leichhardtian fluvifaunula, from which the Greyian was evidently derived.

We know most about the Vlaminghian area, probably the most purely Australian fluvifaunula. The Leichhardtian animals are better known from the rivers flowing into the Gulf of Car-

Fig. 1—The Fluvifaunulae of Australia.

pentaria. The Greyian area may be considered unexplored from the point of view of the naturalist, whilst the Sturtian region, as far as Western Australia is concerned, seems to be practically fishless.

However, it would be rash to dogmatise with the slender data we have at present. We require more specimens for study, more exploration, and forbearance from introducing foreign types to the detriment of our native fauna.

The freshwater fishes of Western Australia are of unique interest. Those of the South-west have long been isolated from south-eastern Australia or Tasmania, yet some, such as *Galaxias* and *Edelia* still show affinities; others like *Bostockia* and *Nannatherina** (Fig. 2) are found nowhere else in the world.

Whether there are fish in the underground waters of the Nullarbor Plain has yet to be demonstrated but I have heard descriptions of blind fishes which may occur there. One interesting blind gudgeon was recently discovered in a well not far from North-West Cape; its nearest ally seems to be a gudgeon *(Carassiops)* which is widely distributed in tropical rivers and has recently been found in the subterranean flow of the Gascoyne. The contents of our north-western rivers are practically unknown,

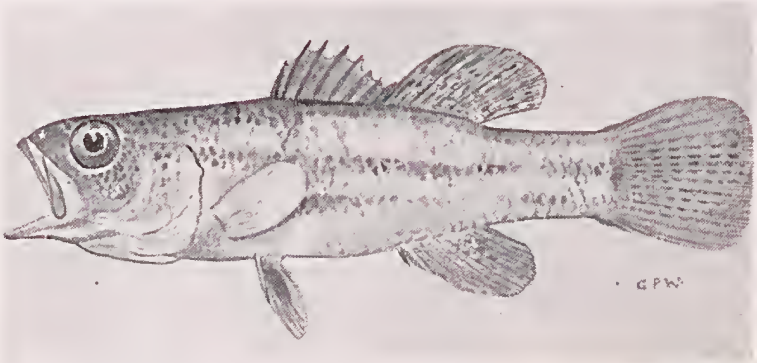

Fig. 2—King River Perchlet, Nannatherina balstoni Regan 1906, a unique Vlaminghian species, from a freshwater creek, Albany district. Gilbert P. Whitley, del.

but may vary with the wet and dry seasons. Marine fishes may occur at Noonkanbah, for example, at one season, and purely freshwater ones at another. There is a great deal of work to be done in this fascinating field and it must be done before man and his introductions can spoil still further the virgin waters and their heritage of wonderful inhabitants.

Following is a tentative list of the freshwater fishes of Western Australia, under the headings of the fluvifaunulae, so far as at present known.

I have excluded the Freshwater Sunfish, *Melanotaenia nigrans*, for the present. It was wrongly recorded (under a synonym) from the Perth district by Castelnau. A Leichhardtian species, it may occur in the far north of this State but until a specimen is forthcoming it seems best to exclude the species from the W.A. list.

**Nannatherina* was named by Tate Regan *(Ann. Mag. Nat. Hist.* (ser. 7), vol. xviii, 1906, p. 451). It is superficially like *Edelia* but has a larger mouth, eyeloid scales, no lateral line, and 31 vertebrae.

I have also excluded introduced species, such as trout, and fishes which only occasionally enter fresh water from the sea.

1. **Vlaminghian Fluvifaunula.**
   Wide-mouthed Lamprey, *Geotria australis* Gray, 1851.
   Narrow-mouth Lamprey, *Yarra singularis* Castelnau, 1872.
   Native Minnow, *Galaxias occidentalis* Ogilby, 1899.
   Mountain Trout, *Galaxias truttaceus hesperius* Whitley, 1944.
   Freshwater Cobbler, *Tandanus bostocki* Whitley, 1944.
   Hardyhead, *Craterocephalus edelensis* (Castelnau, 1873).
   King River Perchlet, *Nannatherina balstoni* Regan, 1906.
   Nightfish, *Bostockia porosa* Castelnau, 1873.
   Pigmy Perch, *Edelia vittata* Castelnau, 1873.
   Goby, *Glossogobius suppositus* (Sauvage, 1880).
   (Also characteristic are the freshwater tortoise, *Chelodina oblonga;* the mussel, *Westralunio;* a freshwater sponge, *Ephydatia multiformis;* and the crustacea, *Palaemonetes australis, Daphnia thomsoni,* and *Chaeraps* spp. The Mountain Trout, *G. t. hesperius,* and a frog, *Hyla cyclorhyncha* of the Albany-Esperance region are allied to Tasmanian forms.)

2. **Sturtian Fluvifaunula.**
   Hardyhead, *Craterocephalus cuneiceps* Whitley, 1944.
   (*Coxiella* and other mollusca are characteristic of this desert fluvifaunula.)

3. **Greyian Fluvifaunula.**
   Spangled Perch, *Madigania unicolor* (Gunther, 1859).*
   Gudgeon, *Carassiops compressus* (Krefft, 1864).
   Blind Gudgeon, *Milyeringa veritas* Whitley, 1945.
   (also characteristic: Northern tortoise, *Chelodina steindachneri,* and the mussel, *Lortiella.)*

4. **Leichhardtian Fluvifaunula.**
   Sawfish, *Pristis clavata* Garman, 1906 (? purely freshwater).
   Leichhardt's Sawfish, *Pristiopsis leichhardti* Whitley, 1945.
   Bony Bream, *Fluvialosa* sp. A.
   Bony Bream, *Fluvialosa,* sp. B.
   Catfish, *Neosilurus brevidorsalis* Gunther, 1867, or allied species.
   Eel, *Anguilla bicolor* McClelland, 1844.
   Spangled Perch, *Madigania unicolor* (Gunther, 1859).
   Grunter, *Mesopristes jenkinsi* Whitley, 1945.
   Chanda Perch, *Aeanthoperca gulliveri* Castelnau, 1878.
   Archer Fish, *Toxotes chatarens* (Ham-Buch., 1822).
   Gudgeon, *Carassiops compressus* (Krefft, 1864)—ex Bruce Shipway, Mss.
   Goby, *Glossogobius giuris* (Ham-Buch., 1822).

ANIMAL LIFE IN MANGROVES

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Mangroves are tropical trees of which numerous genera and species are known. The most common in Western Australia is the white mangrove *(Avicennia marina)* which extends on the mainland as far south as Shark Bay, where I have found a few growing on the eastern shore of Dirk Hartog Island and on Peron Peninsula. However there is a curious outlier in a restricted

*The wide range of this fish, commonly referred to in the literature as *Therapon unicolor,* almost coincides with that of the frog, *Hyla rubella.*